

CLAIMS

What is claimed is:

1. A radio frequency/microwave junction-type circulator, comprising:
5 a plurality of signal ports;
 a plurality of junctions connected in cascade and configured to provide a plurality of transmission paths between the signal ports, each junction including a conductor element patterned to correspond to at least a portion of the plurality of transmission paths;
10 a ferrite component configured to overlay the plurality of junctions; and
 a permanent magnet arranged in relation to the ferrite component so as to generate a magnetic field in the ferrite component, thereby causing non-reciprocal operation of the plurality of transmission paths between the signal ports.

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2. The circulator of claim 1 wherein the ferrite component comprises two ferrite elements and the conductor elements are sandwiched between the two ferrite elements.

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3. The circulator of claim 1 wherein the conductor elements comprise corresponding portions of a single conductor component.

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4. The circulator of claim 1 wherein the plurality of junctions, the ferrite component, and the permanent magnet are disposed in a metal housing.

5 5. The circulator of claim 4 wherein the metal housing includes a cover and a base portion and the circulator further comprises a first pole piece disposed between the permanent magnet and the ferrite component, a second pole piece disposed between the base portion of the housing and the conductor elements, and a cover return component disposed between the housing cover and the permanent magnet.

10 15 6. The circulator of claim 5 wherein the first and second pole pieces, the permanent magnet, the metal housing, and the cover return component are arranged in relation to each other so as to form a magnetic circuit for generating the magnetic field in the ferrite component.

20 25 7. The circulator of claim 2 further including a dielectric constant medium disposed between the ferrite elements and a ground plane disposed between the ferrite component and the permanent magnet.

8. The circulator of claim 7 wherein the ferrite elements, the dielectric constant medium, the conductor elements, and the ground plane are arranged in relation to each other so as to form a radio frequency/microwave

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circuit for causing the non-reciprocal operation of the transmission paths when the magnetic field is generated in the ferrite component.

5 9. A method of manufacturing a radio frequency/microwave junction-type circulator, comprising the steps of:

10 providing a plurality of junctions connected in cascade and configured to form a plurality of transmission paths between a plurality of signal ports, each junction including a conductor element patterned to correspond to at least a portion of the plurality of transmission paths;

15 providing a ferrite component configured to overlay the plurality of junctions; and

20 providing a permanent magnet arranged in relation to the ferrite component so as to generate a magnetic field in the ferrite component, thereby causing non-reciprocal operation of the transmission paths between the plurality of signal ports.

10. The method of claim 9 further including the step of disposing the plurality of junctions, the ferrite component, and the permanent magnet in a metal housing.

25 11. The method of claim 10 further including the steps of providing a first pole piece disposed between the permanent magnet and the ferrite component, providing a second pole piece disposed between a base portion of the

metal housing and the conductor elements, and providing a cover return component disposed between a cover of the metal housing and the permanent magnet.

5 12. The method of claim 9 further including the steps of providing a dielectric constant medium between first and second ferrite elements of the ferrite component, and providing a ground plane disposed between the ferrite component and the permanent magnet.

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